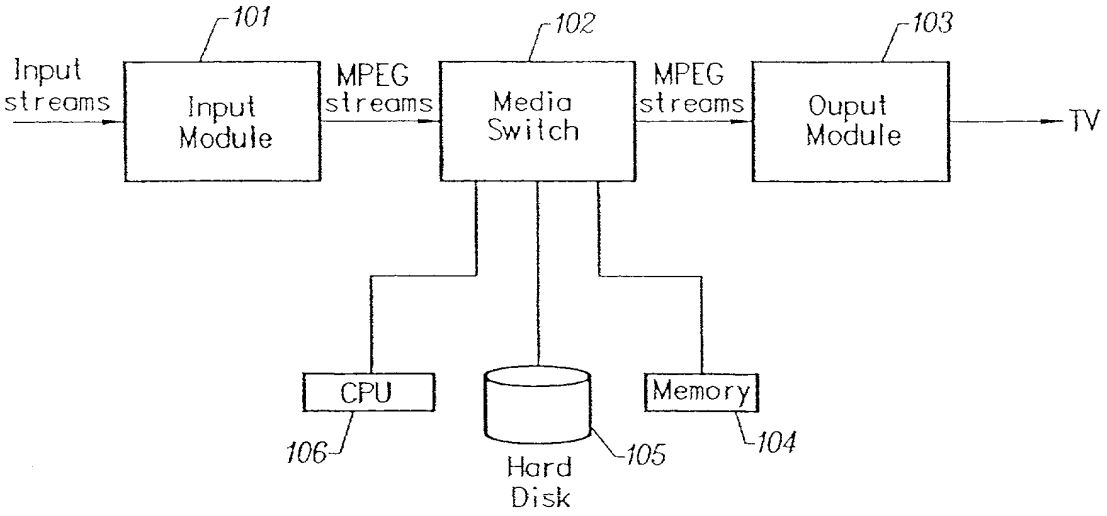
101
Input
streams
Input
Module
MPEG
streams
102
Media
Switch
MPEG
streams
103
Ouput
Module
TV
CPU
106
Hard
Disk
105
Memory
104

FIG. 1

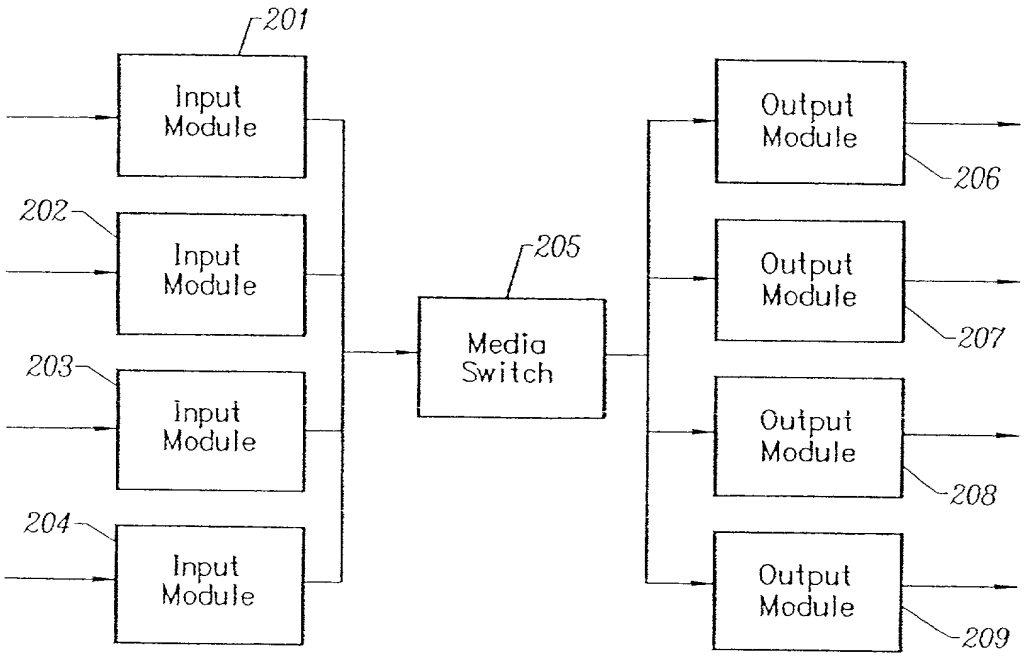
201
Input Module
202
Input Module
203
Input Module
204
Input Module
205
Media Switch
Output Module
206
Output Module
207
Output Module
208
Output Module
209

FIG. 2

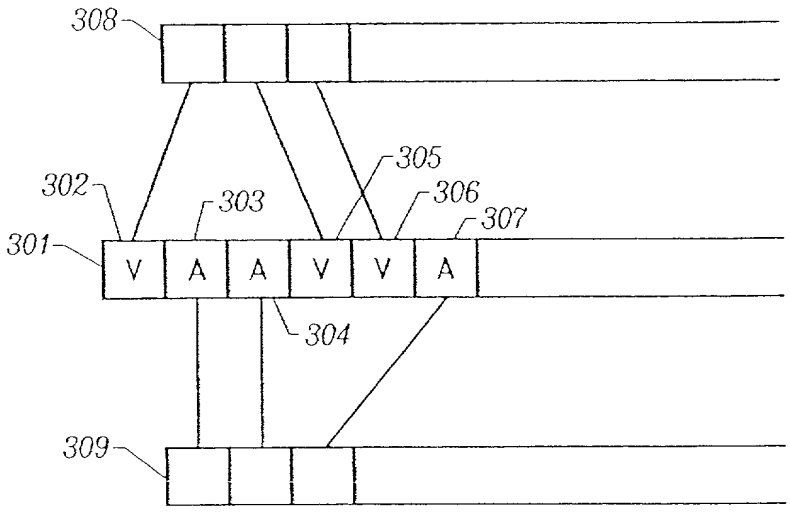

FIG. 3

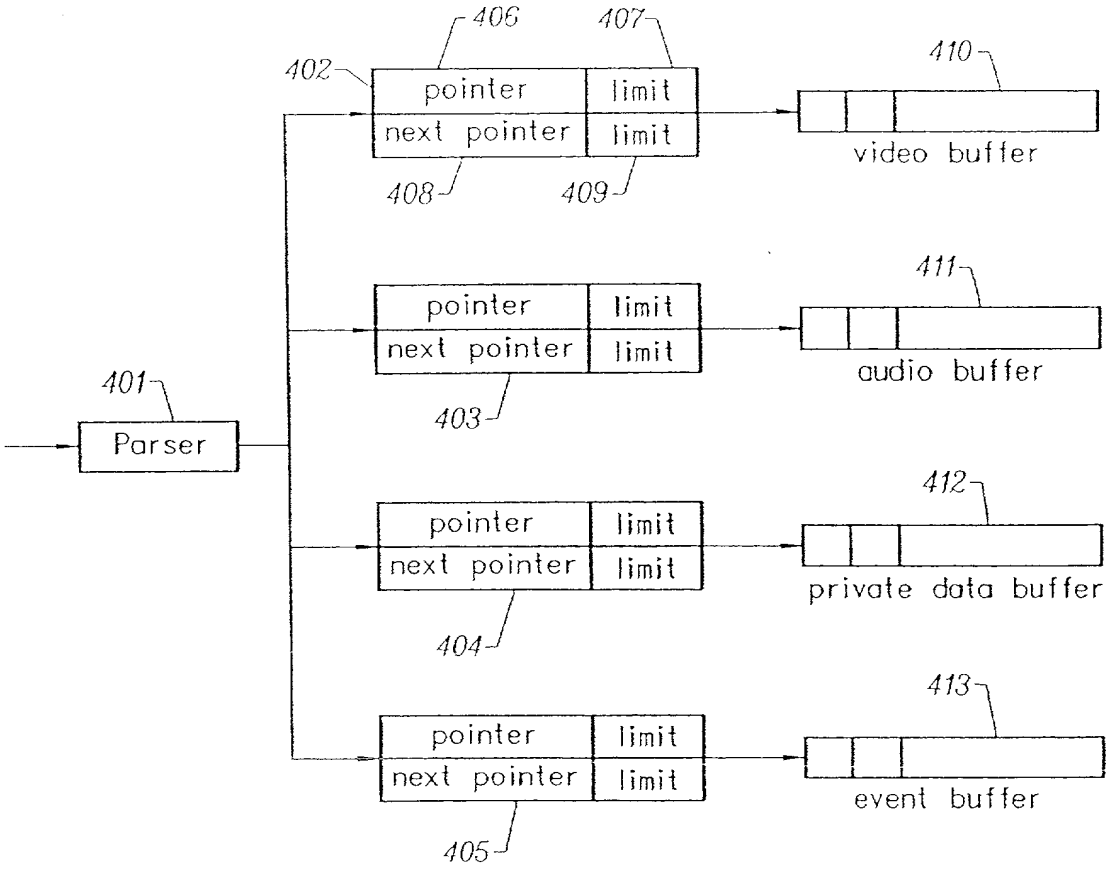
406
407
402
pointer
limit
next pointer
limit
408
409
410
video buffer
411
pointer
limit
next pointer
limit
audio buffer
401
Parser
403
412
pointer
limit
next pointer
limit
private data buffer
404
413
pointer
limit
next pointer
limit
event buffer
405

FIG. 4

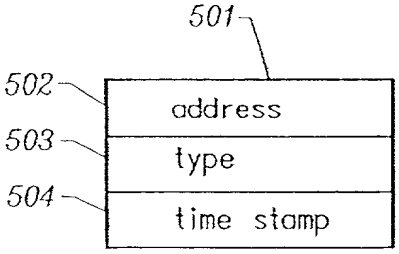
501
502
address
503
type
504
time stamp

FIG. 5

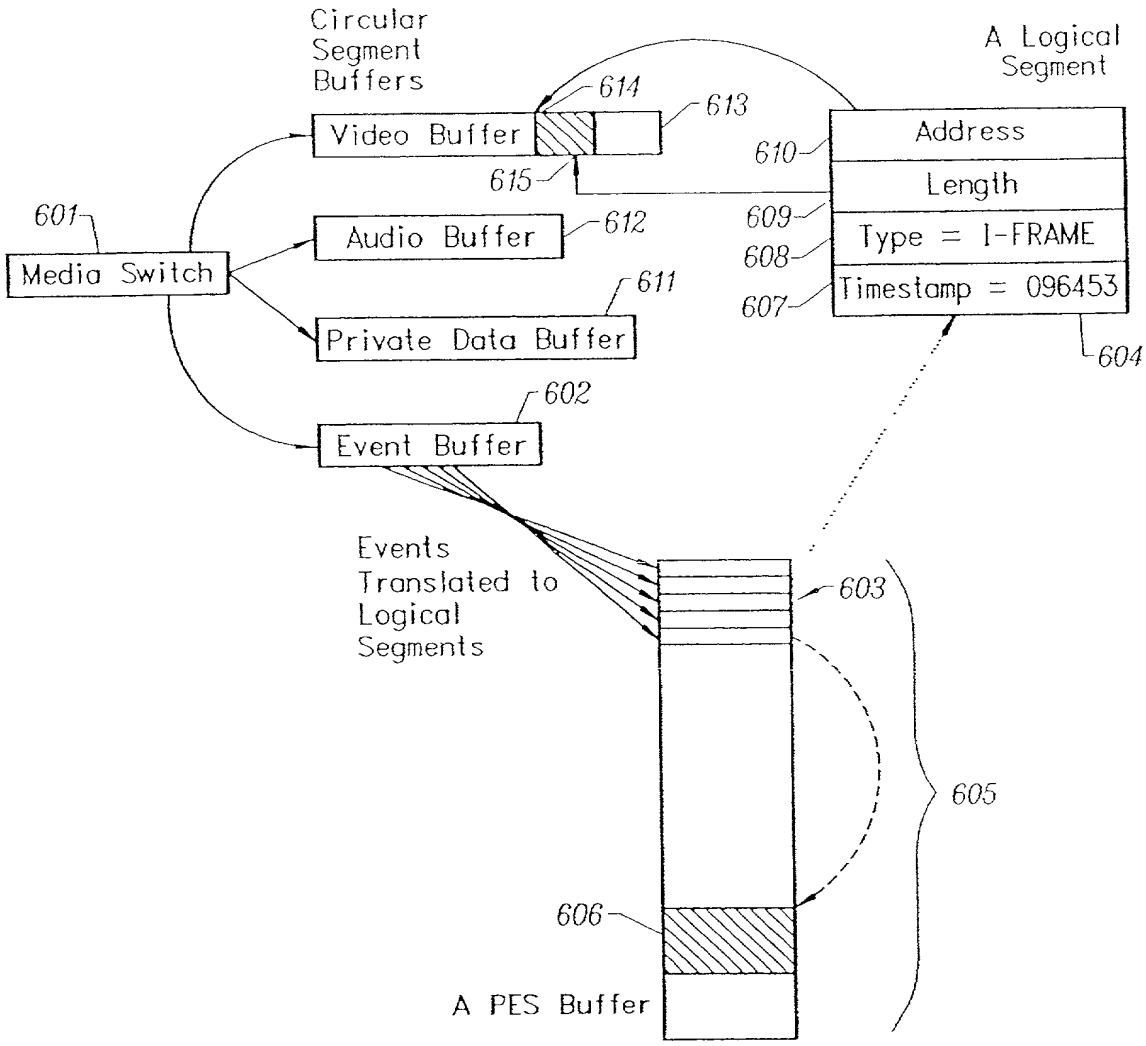
Circular
Segment
Buffers
A Logical
Segment
614
613
Video Buffer
Address
610
615
Length
601
Audio Buffer
612
609
Type = I-FRAME
Media Switch
608
611
Timestamp = 096453
607
Private Data Buffer
604
602
Event Buffer
Events
Translated to
Logical
Segments
603
605
606
A PES Buffer

FIG. 6

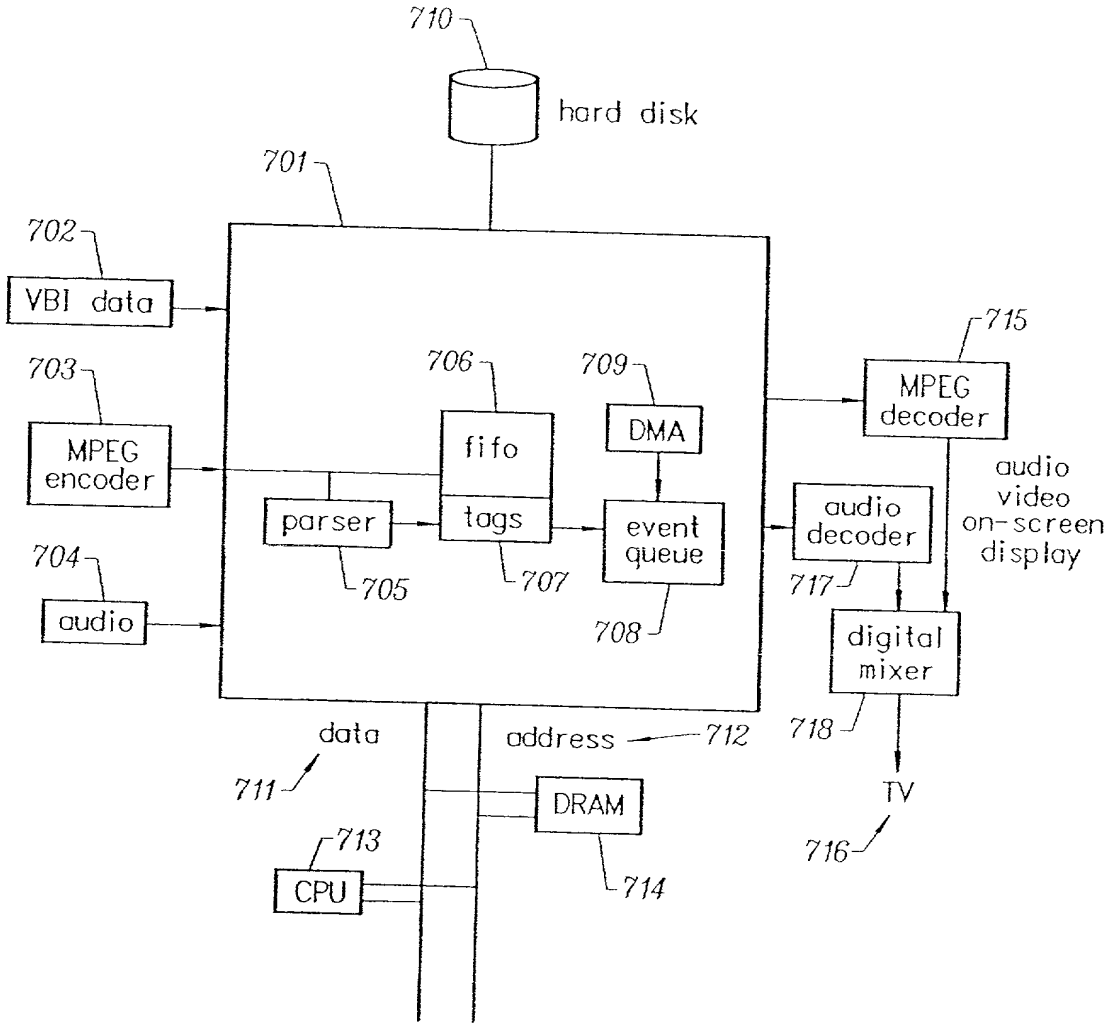
710
hard disk
701
702
VBI data
703
MPEG encoder
704
audio
706
fifo
parser
tags
705
707
709
DMA
event queue
708
715
MPEG decoder
audio decoder
717
audio video on-screen display
digital mixer
718
TV
716
data
711
address
712
DRAM
714
713
CPU

FIG. 7

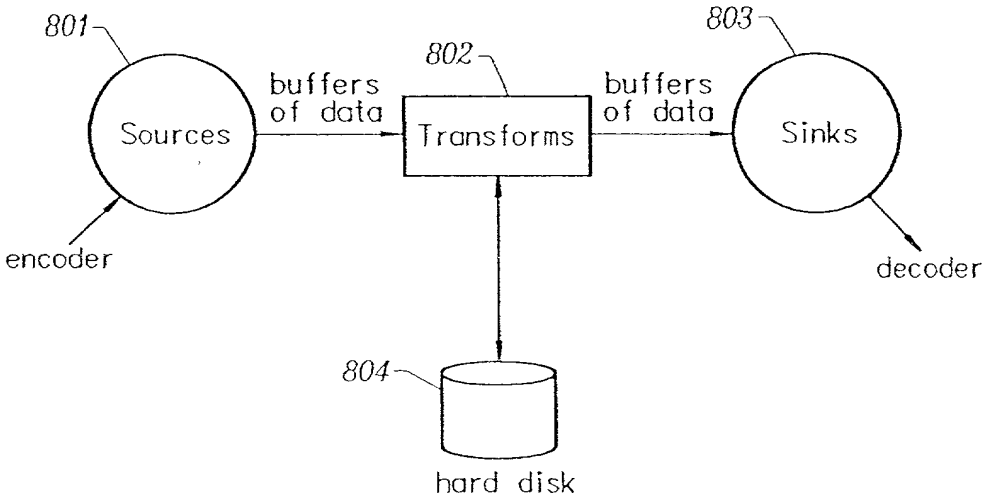
801
Sources
buffers
of data
802
Transforms
buffers
of data
803
Sinks
encoder
decoder
804
hard disk

FIG. 8

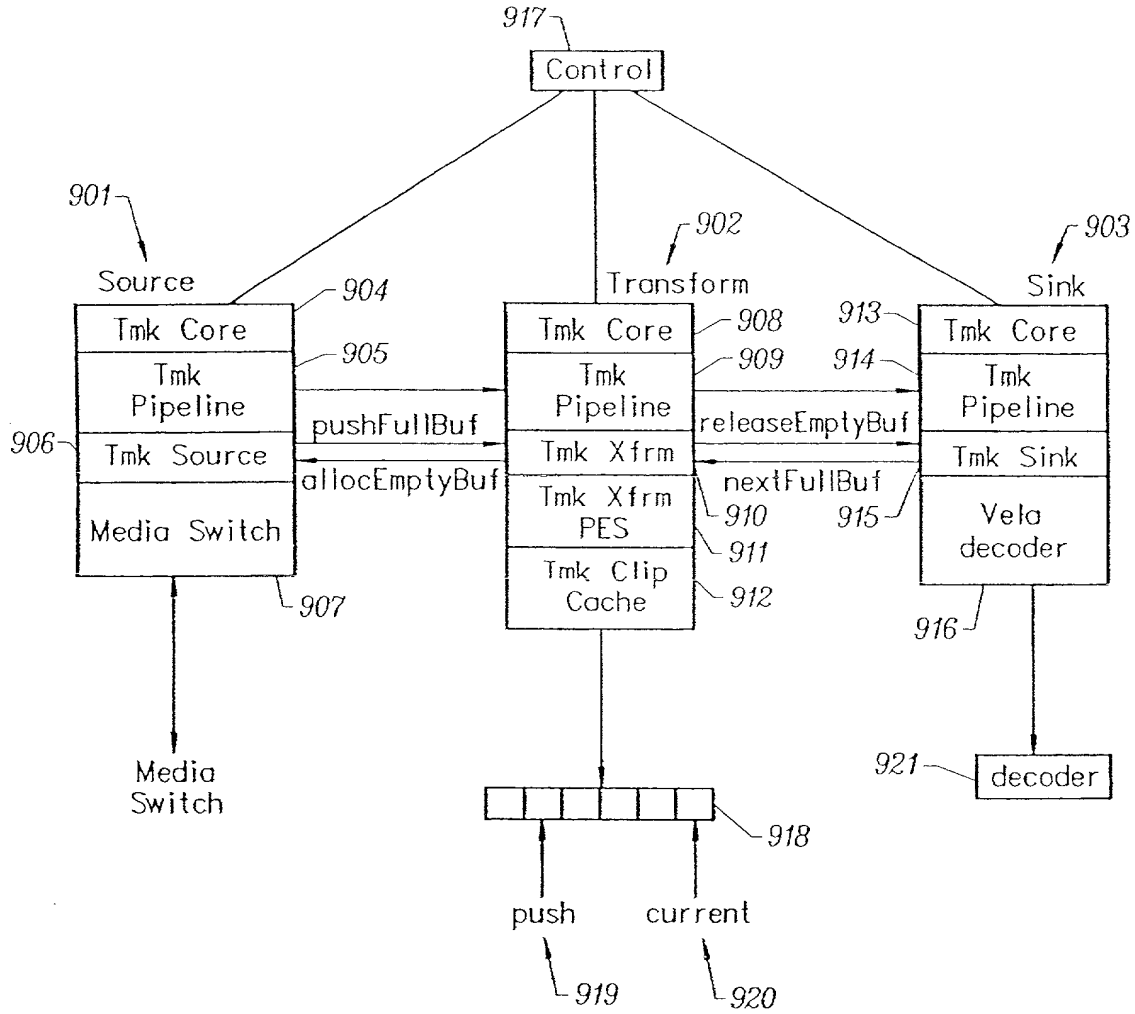
917
Control
901
Source
902
Transform
903
Sink
904
905
906
907
908
909
910
911
912
913
914
915
916
Tmk Core
Tmk Pipeline
Tmk Source
Media Switch
pushFullBuf
allocEmptyBuf
Tmk Core
Tmk Pipeline
Tmk Xfrm
Tmk Xfrm PES
Tmk Clip Cache
releaseEmptyBuf
nextFullBuf
Tmk Core
Tmk Pipeline
Tmk Sink
Vela decoder
Media Switch
decoder
921
918
push
current
919
920

FIG. 9

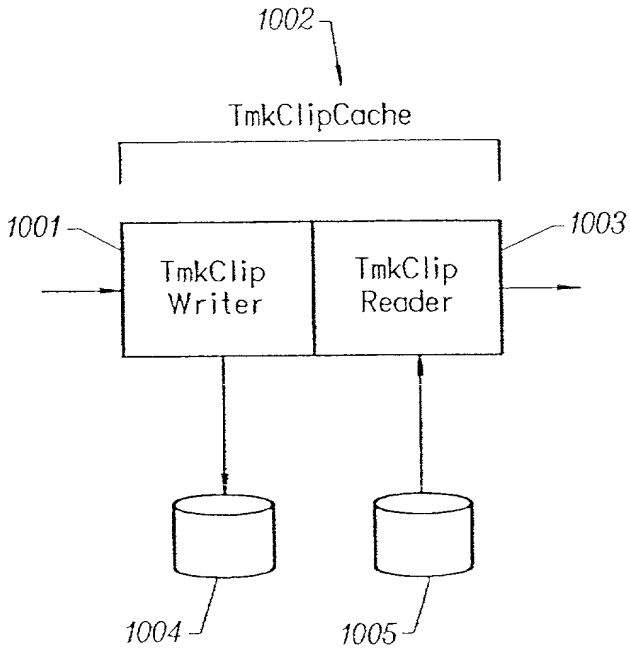
1002
TmkClipCache
1001
TmkClip Writer
TmkClip Reader
1003
1004
1005

FIG. 10

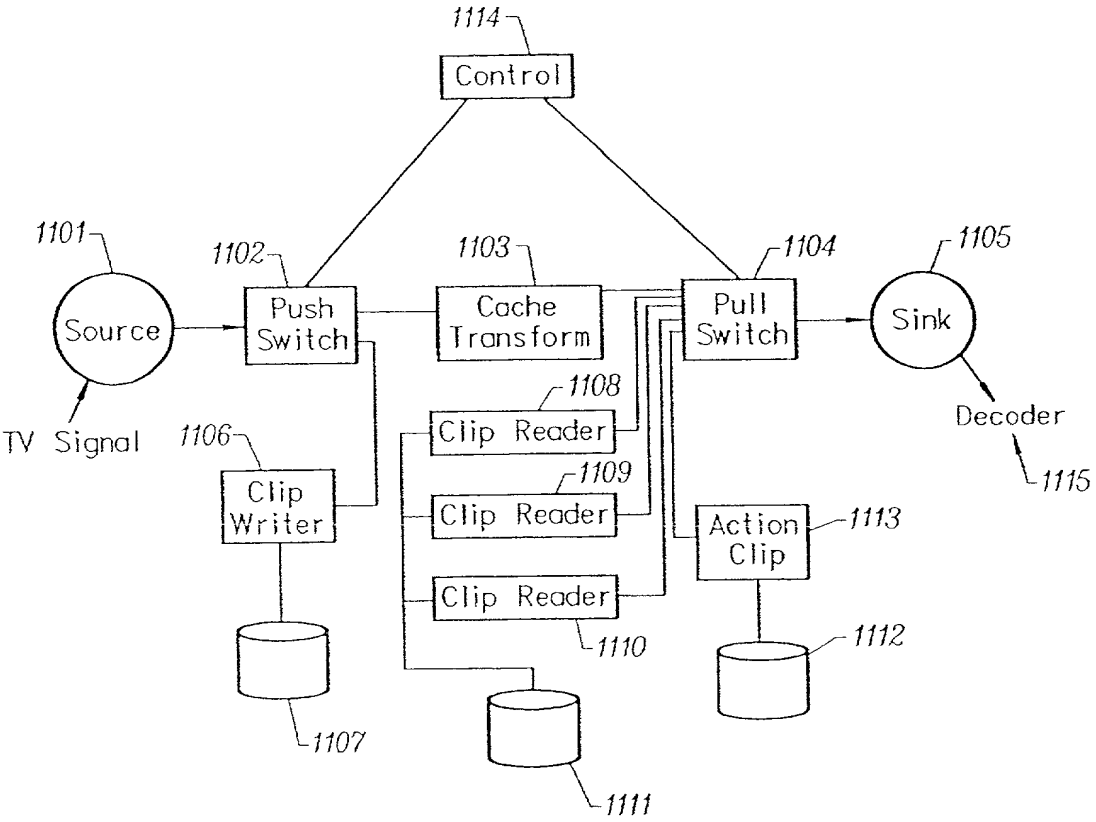
1114
Control
1101
1102
1103
1104
1105
Source
Push Switch
Cache Transform
Pull Switch
Sink
TV Signal
1108
Clip Reader
Decoder
1106
1115
1109
Clip Writer
Clip Reader
Action Clip
1113
Clip Reader
1110
1112
1107
1111

FIG. 11

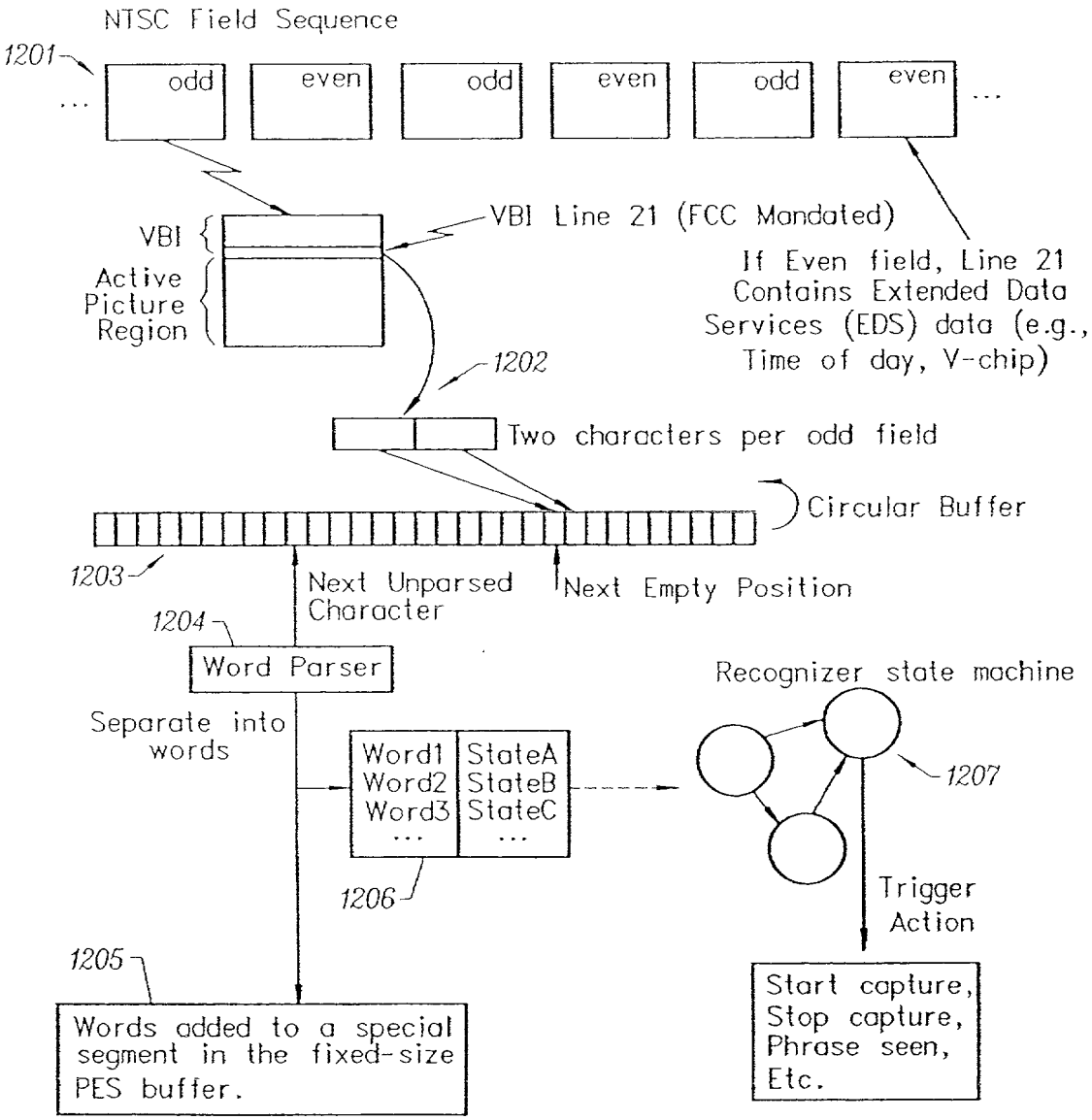
NTSC Field Sequence
1201
odd
even
odd
even
odd
even
VBI
Active Picture Region
VBI Line 21 (FCC Mandated)
If Even field, Line 21 Contains Extended Data Services (EDS) data (e.g., Time of day, V-chip)
1202
Two characters per odd field
Circular Buffer
1203
Next Unparsed Character
Next Empty Position
1204
Word Parser
Separate into words
Word1
Word2
Word3
StateA
StateB
StateC
1206
Recognizer state machine
1207
Trigger Action
1205
Words added to a special segment in the fixed-size PES buffer.
Start capture, Stop capture, Phrase seen, Etc.

FIG. 12

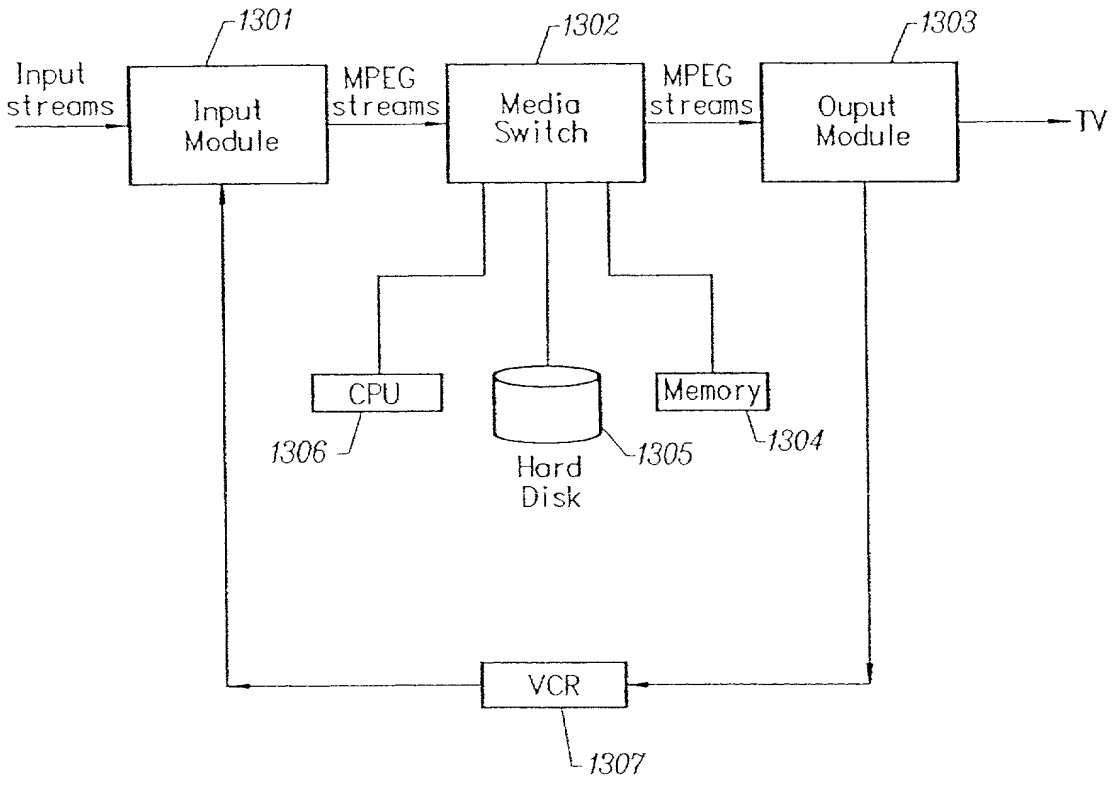
1301
1302
1303
Input streams
Input Module
MPEG streams
Media Switch
MPEG streams
Ouput Module
TV
CPU
1306
Hard Disk
1305
Memory
1304
VCR
1307

FIG. 13

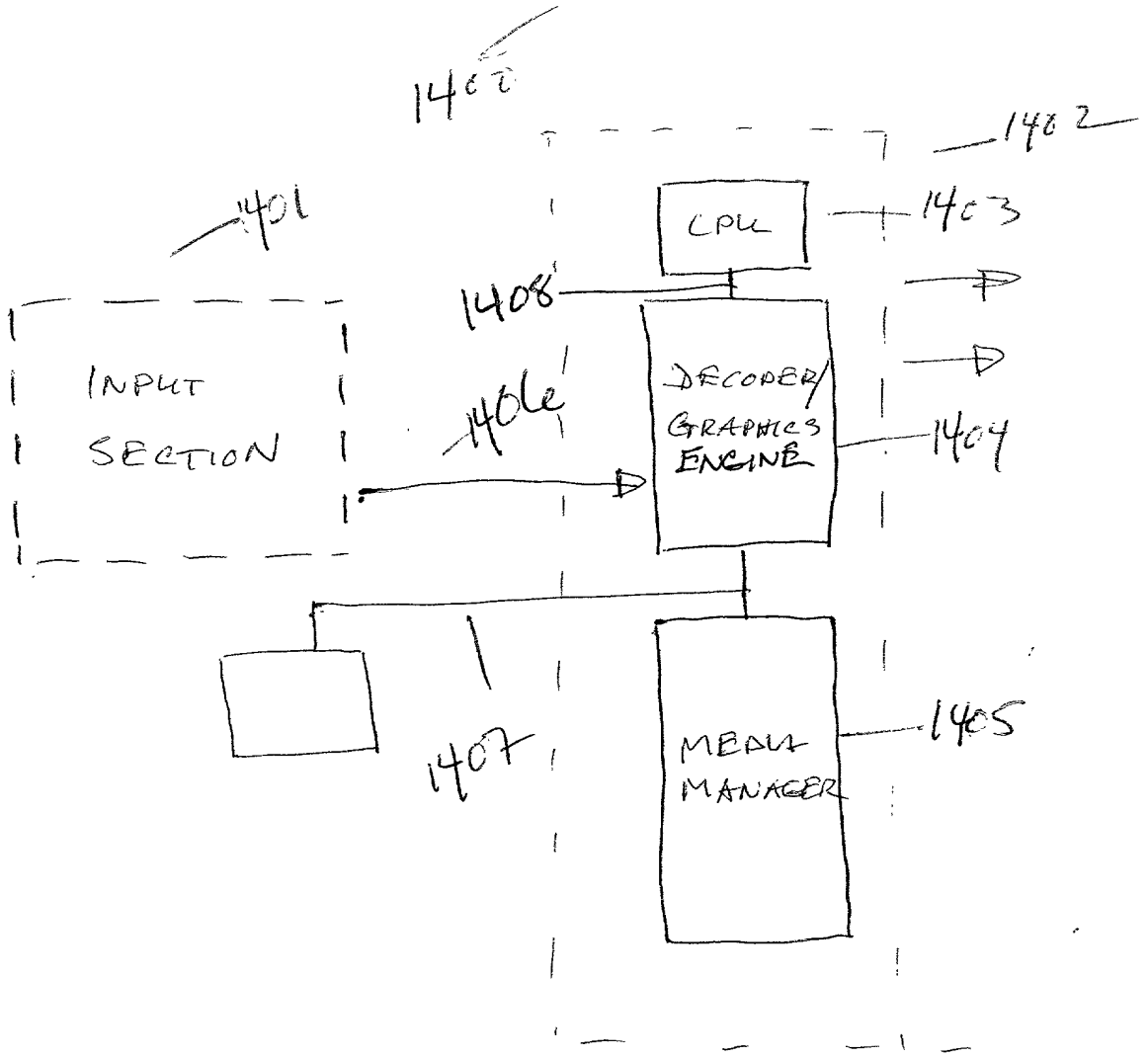
1402
1401
CPU
1403
1408
INPUT
SECTION
1406
DECODER/
GRAPHICS
ENGINE
1404
1407
MEM
MANAGER
1405

Figure 14

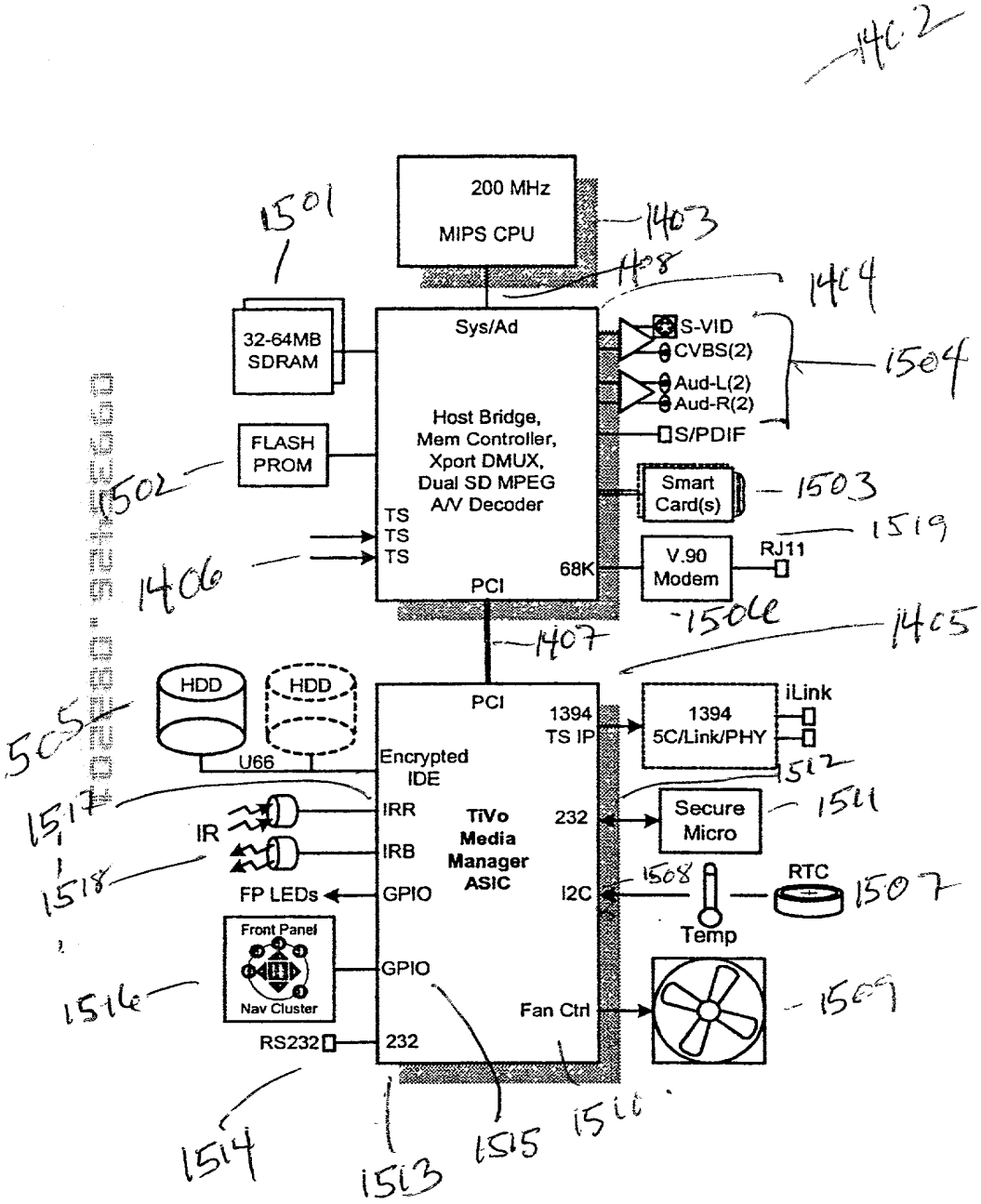
1402
200 MHz
MIPS CPU
1403
1408
1404
1501
32-64MB
SDRAM
Sys/Ad
S-VID
CVBS(2)
Aud-L(2)
Aud-R(2)
S/PDIF
1504
FLASH
PROM
1502
Host Bridge,
Mem Controller,
Xport DMUX,
Dual SD MPEG
A/V Decoder
Smart
Card(s)
1503
1519
TS
TS
TS
1406
68K
V.90
Modem
RJ11
PCI
1407
1505
HDD
HDD
U66
PCI
1394
TS IP
1394
5C/Link/PHY
iLink
1512
Encrypted
IDE
IRR
IR
IRB
TiVo
Media
Manager
ASIC
232
Secure
Micro
1511
1518
FP LEDs
GPIO
I2C
1508
RTC
1507
Temp
Front Panel
Nav Cluster
1516
GPIO
Fan Ctrl
1509
RS232
232
1514
1513
1515
1510

Figure 15

6,965,645 - 06/25/04

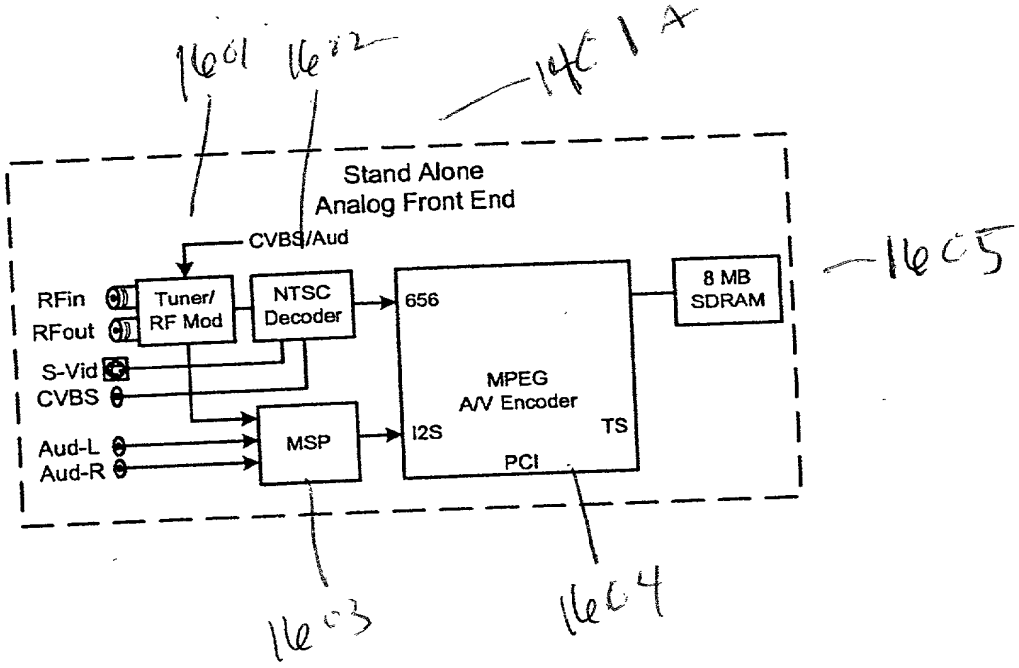

Figure 16

D3535455 - 062204

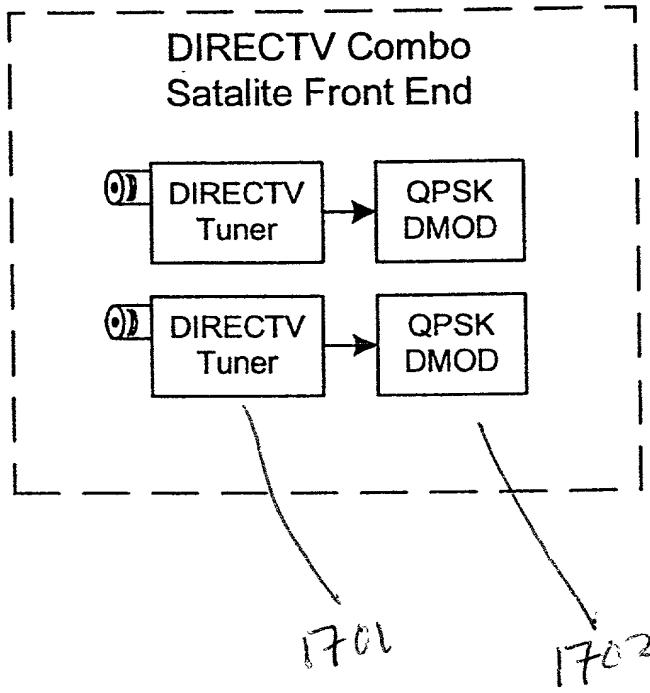

Figure 17

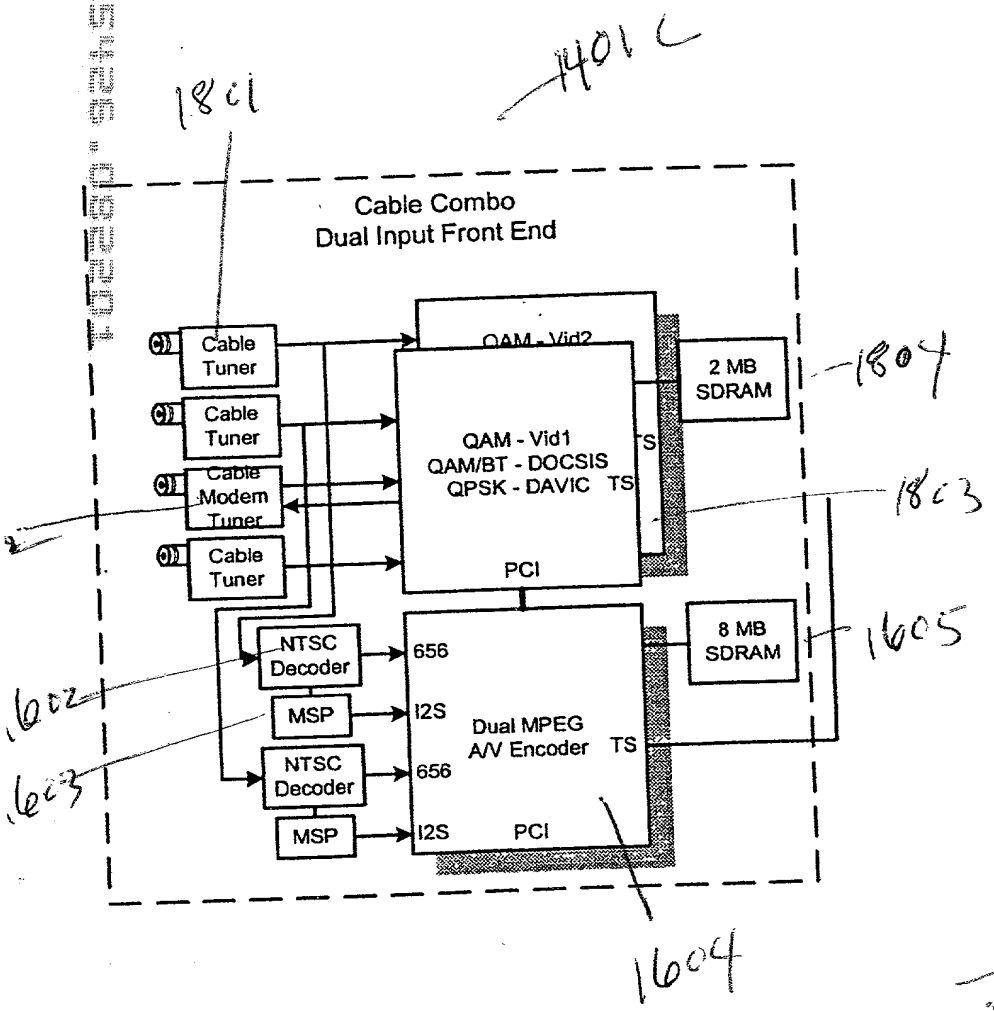
1801
1401C
Cable Combo
Dual Input Front End
Cable Tuner
Cable Tuner
Cable Modem Tuner
Cable Tuner
QAM - Vid2
QAM - Vid1
QAM/BT - DOCSIS
QPSK - DAVIC
TS
PCI
2 MB SDRAM
1804
1803
8 MB SDRAM
1605
NTSC Decoder
MSP
NTSC Decoder
MSP
656
I2S
656
I2S
Dual MPEG A/V Encoder
TS
PCI
1602
1603
1604

Figure 18

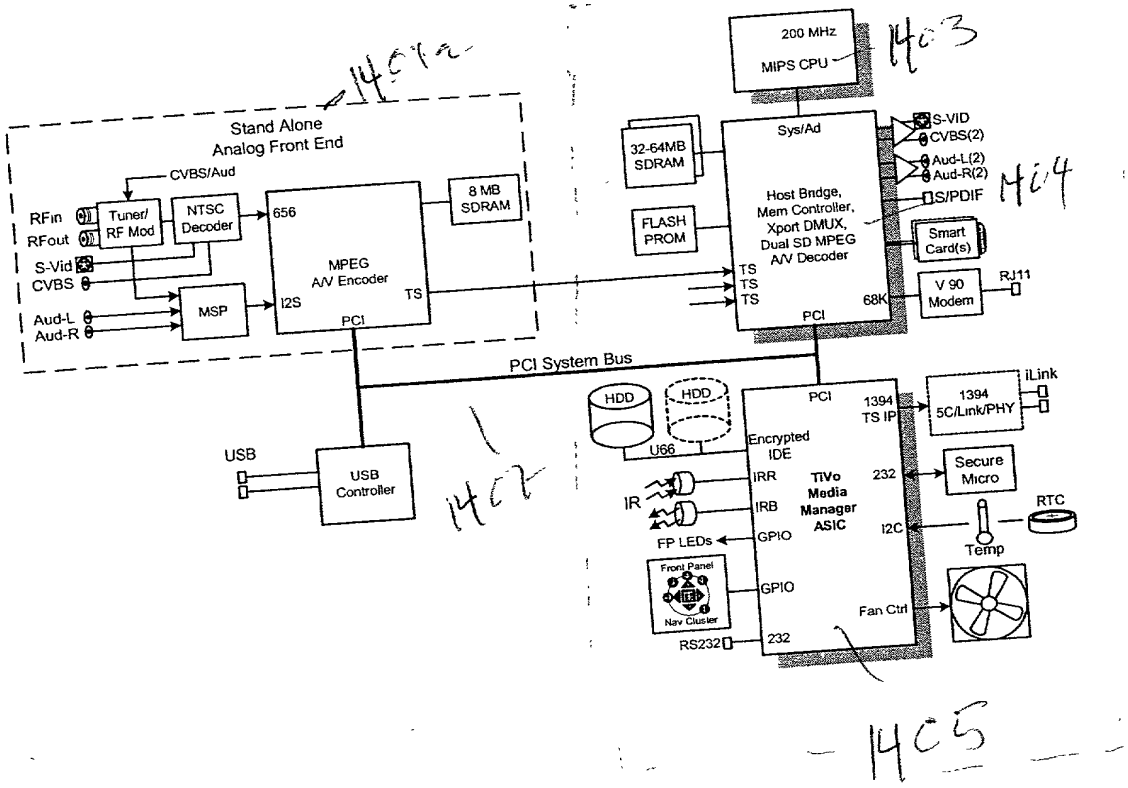
Stand Alone
Analog Front End
CVBS/Aud
RFin
RFout
Tuner/
RF Mod
NTSC
Decoder
656
8 MB
SDRAM
MPEG
A/V Encoder
TS
S-Vid
CVBS
Aud-L
Aud-R
MSP
I2S
PCI
200 MHz
MIPS CPU
32-64MB
SDRAM
FLASH
PROM
Sys/Ad
Host Bridge,
Mem Controller,
Xport DMUX,
Dual SD MPEG
A/V Decoder
S-VID
CVBS(2)
Aud-L(2)
Aud-R(2)
S/PDIF
Smart
Card(s)
V 90
Modem
RJ11
68K
TS
TS
TS
PCI
PCI System Bus
USB
USB
Controller
HDD
HDD
U66
PCI
1394
TS IP
1394
5C/Link/PHY
iLink
Encrypted
IDE
IRR
IRB
GPIO
TiVo
Media
Manager
ASIC
232
Secure
Micro
I2C
RTC
Temp
IR
FP LEDs
Front Panel
Nav Cluster
GPIO
Fan Ctrl
RS232
232
402a
403
404
402
405
402
405

Figure 19

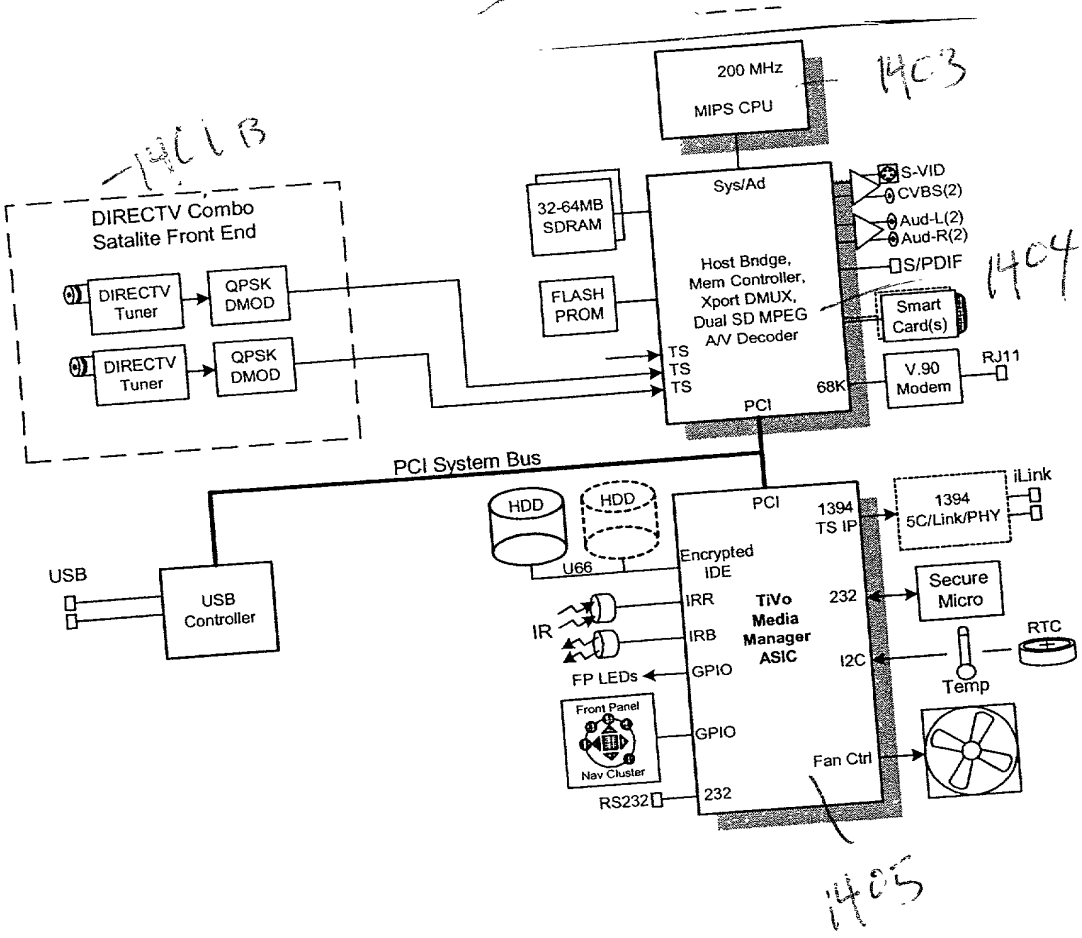
200 MHz
MIPS CPU
1403
1413
DIRECTV Combo
Satalite Front End
DIRECTV Tuner
QPSK DMOD
DIRECTV Tuner
QPSK DMOD
32-64MB SDRAM
FLASH PROM
Sys/Ad
Host Bridge, Mem Controller, Xport DMUX, Dual SD MPEG A/V Decoder
S-VID
CVBS(2)
Aud-L(2)
Aud-R(2)
S/PDIF
Smart Card(s)
1404
TS
TS
TS
68K
V.90 Modem
RJ11
PCI
PCI System Bus
HDD
HDD
U66
PCI
1394 TS IP
1394 5C/Link/PHY
iLink
Encrypted IDE
IRR
IRB
GPIO
TiVo Media Manager ASIC
232
Secure Micro
I2C
RTC
Temp
IR
FP LEDs
Front Panel
Nav Cluster
GPIO
Fan Ctrl
RS232
232
USB
USB Controller
1405

Figure 20

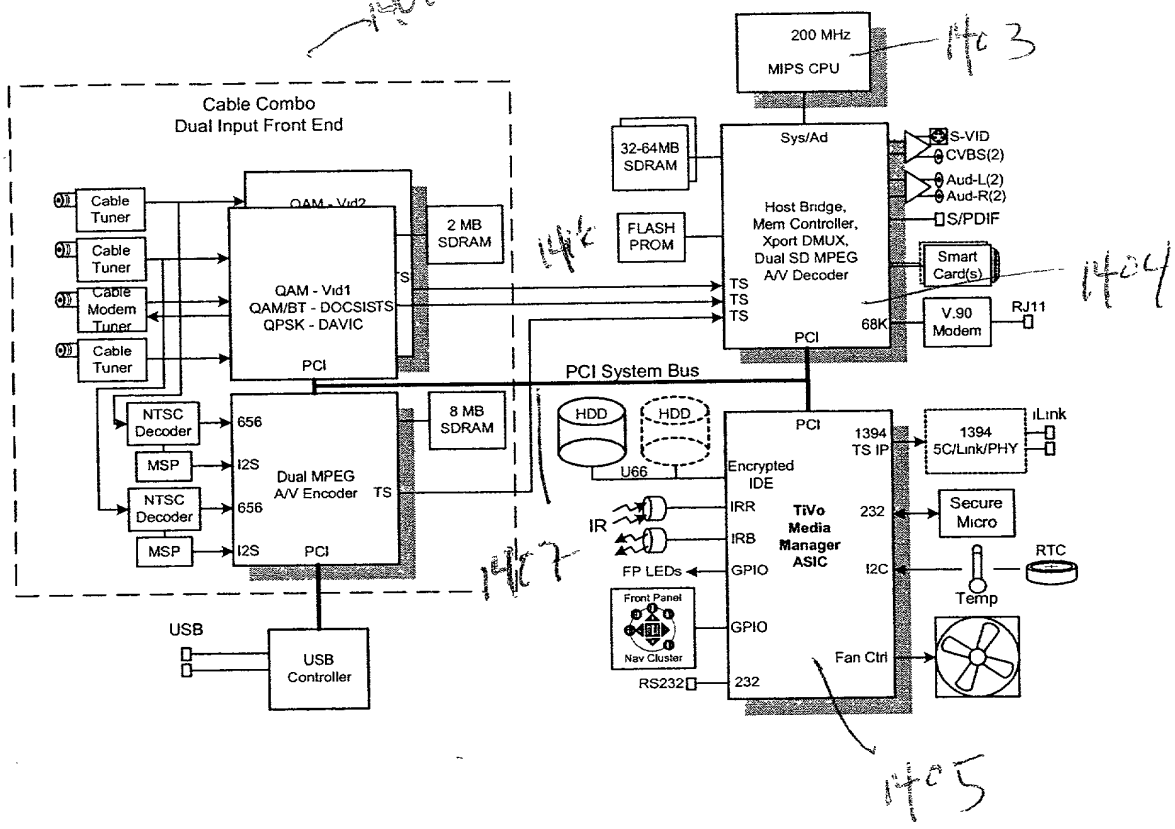
Cable Combo
Dual Input Front End
Cable Tuner
Cable Tuner
Cable Modem Tuner
Cable Tuner
QAM - Vid1
QAM/BT - DOCSISTS
QPSK - DAVIC
PCI
2 MB SDRAM
NTSC Decoder
MSP
NTSC Decoder
MSP
656
I2S
656
I2S
Dual MPEG A/V Encoder
TS
PCI
8 MB SDRAM
USB
USB Controller
200 MHz
MIPS CPU
32-64MB SDRAM
FLASH PROM
Sys/Ad
Host Bridge, Mem Controller, Xport DMUX, Dual SD MPEG A/V Decoder
TS
TS
TS
PCI
S-VID
CVBS(2)
Aud-L(2)
Aud-R(2)
S/PDIF
Smart Card(s)
V.90 Modem
68K
RJ11
PCI System Bus
HDD
HDD
U66
IR
FP LEDs
Front Panel
Nav Cluster
RS232
PCI
Encrypted IDE
IRR
IRB
GPIO
GPIO
TiVo Media Manager ASIC
232
I2C
Fan Ctrl
1394 TS IP
1394 5C/Link/PHY
iLink
Secure Micro
RTC
Temp

Figure 21

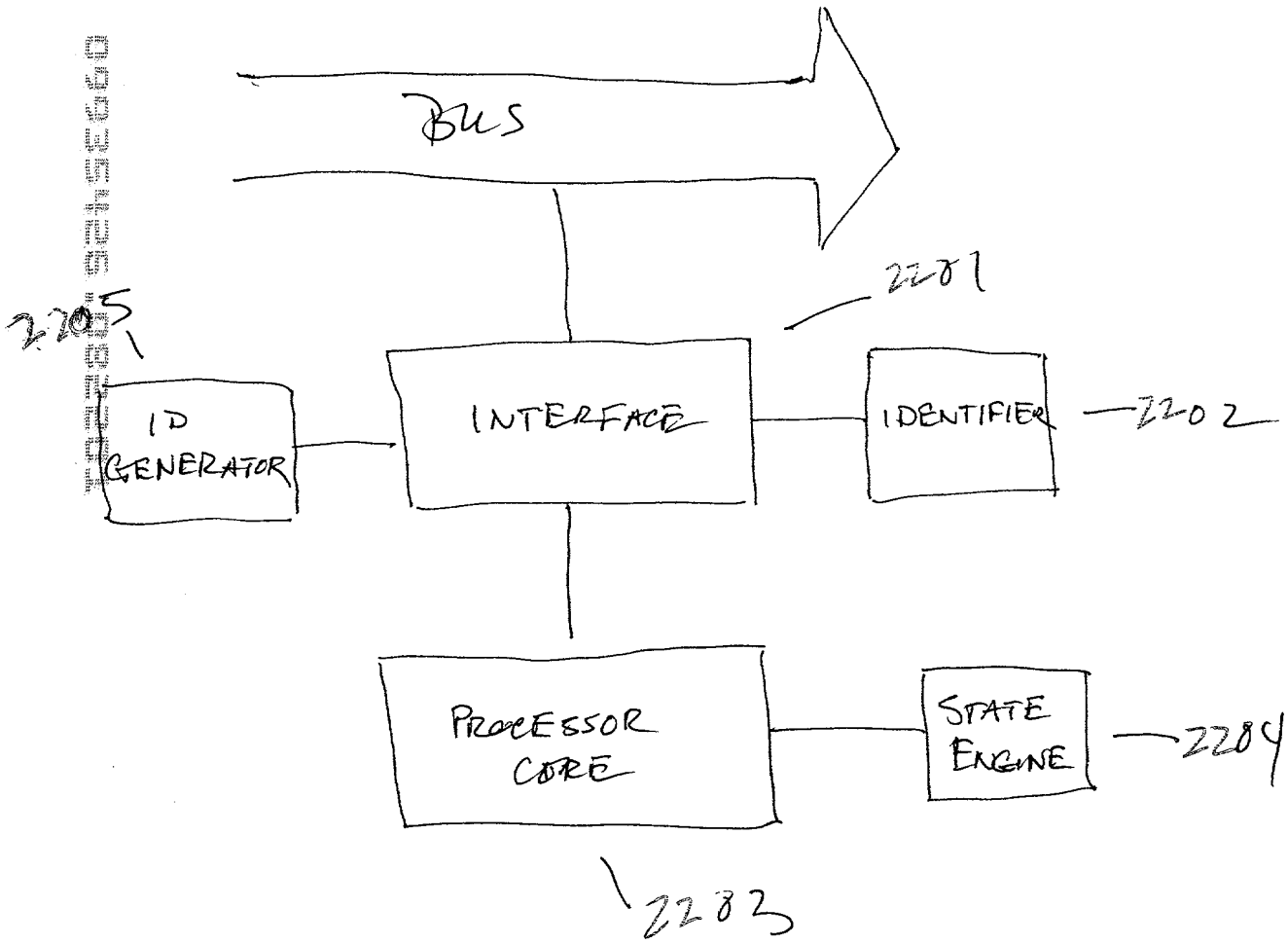
BUS
2201
2205
ID GENERATOR
INTERFACE
IDENTIFIER
2202
PROCESSOR CORE
STATE ENGINE
2204
2203

Figure 22